REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Delete vendor CAGE 27014. Change vendor CAGE 18714 to 34371. Add vendor CAGE code 01295. Change drawing CAGE code to 67268. Change to table II and figure 4. Editorial changes	1990 SEP 14	M.A. Frye

CURRENT CAGE CODE 67268

REV																			
SHEET																			
REV																			
SHEET																			

REV STATUS OF SHEETS															
REV	A	A	A	A	A	A	A	A	A	A	A	A		
SHEET	1	2	3	4	5	6	7	8	9	10	11	12		

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY
Marcia B. Kelleher

CHECKED BY
Thomas J. Riccuitti

APPROVED BY
Michael A. Frye

DRAWING APPROVAL DATE
14 APRIL 1987

REVISION LEVEL
A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, DIGITAL, HIGH-SPEED CMOS, BUS TRANSCEIVER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**14933**	**5962-87809**

SHEET 1 OF 12

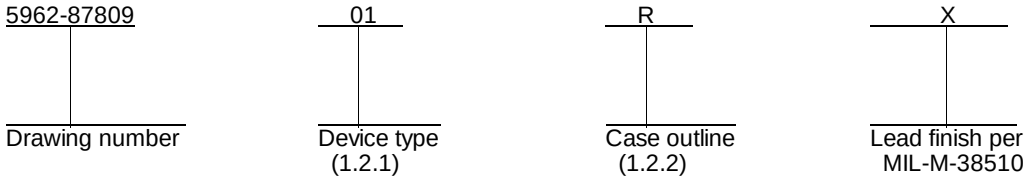
DESC FORM 193
JUL 94

5962-E1759

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:



1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	54HC640	Octal three-state inverting bus transceiver

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
R	D-8 (20-lead, 1.060" x .310" x .200""), dual-in-line package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Supply voltage range	-0.5 Vdc to +7.0 V dc
DC input voltage	-0.5 V dc to V_{CC} + 0.5 V dc
DC output voltage	-0.5 V dc to V_{CC} + 0.5 V dc
Clamp diode current	±20 mA
DC outout current (per pin)	±35 mA
DC V_{CC} or GND current (per pin)	±70 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D) 2/	500 mW
Lead temperature (soldering, 10 seconds)	+260°C
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175°C

1/ Unless otherwise specified, all voltages are referenced to ground.
2/ For T_C = +100°C to +125°C, derate linearly at 8 mW/°C.

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	+2.0 V dc to +6.0 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Input voltage range (V_{IN})	0.0 V to V_{CC}
Output voltage range (V_{OUT})	0.0 V to V_{CC}
Input rise or fall time:	
V_{CC} = 2.0 V	0 to 1,000 ns
V_{CC} = 4.5 V	0 to 500 ns
V_{CC} = 6.0 V	0 to 400 ns

2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Logic diagram. The logic diagram shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ 1/ unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High level output voltage	V_{OH}	V_{IN} = VIH minimum or V_{IL} maximum $\|I_O\| \le 20$ µA	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	1,2,3	1.9 4.4 5.9		V
		$\|I_O\| \le 6.0$ mA	V_{CC} = 4.5 V		3.7		
		$\|I_O\| \le 7.8$ mA	V_{CC} = 6.0 V		5.2		
Low level output voltage	V_{OL}	$V_{IN} = V_{IH}$ minimum or V_{IL} maximum $\|I_O\| \le 20$ µA	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	1,2,3		0.1 0.1 0.1	V
		$\|I_O\| \le 6.0$ mA	V_{CC} = 4.5 V			0.4	
		$\|I_O\| \le 7.8$ mA	V_{CC} = 6.0 V			0.4	
High level input voltage	V_{IH}	2/	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	1,2,3	1.5 3.15 4.2		V
Low level input voltage	V_{IL}	2/	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	1,2,3		0.3 0.9 1.2	V
Input capacitance	C_{IN}	V_{CC} = GND, T_C = +25°C See 4.3.1c		4		10	pF
I/0 capacitance	C_{I0}	V_{CC} = 6 V, T_C = +25°C 3/ See 4.3.1c		4		20	pF
Quiescent current	I_{CC}	V_{CC} = 6.0 V, $V_{IN} = V_{CC}$ or GND		1,2,3		160	µA
Input leakage current	I_{IN}	V_{CC} = 6.0 V, $V_{IN} = V_{CC}$ or GND		1,2,3		±1	µA
Three-state output current	I_{0Z}	V_{CC} = 6.0 V, $V_0 = V_{CC}$ or GND $G = V_{IH}$		1,2,3		±10	µA
Functional tests		See 4.3.1d		7,8			

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ 1/ unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Propagation delay time, data to output 4/ See figure 4	t_{PHL}, t_{PLH}	T_C = +25°C C_L = 50 pF ±10%	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	9		105 21 18	ns
		T_C = -55°C, +125°C C_L = 50 pF ±10%	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	10,11		160 32 27	ns
Output enable time, G to output 4/ See figure 4	t_{PZH}, t_{PZL}	T_C = +25°C C_L = 50 pF ±10% R_L = 1 kΩ	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	9		230 46 41	ns
		T_C = -55°C, +125°C C_L = 50 pF ±10% R_L = 1 kΩ	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	10,11		340 68 58	ns
Output disable time, G to output 4/ See figure 4	t_{PHZ}, t_{PLZ}	T_C = +25°C C_L = 50 pF ±10% R_L = 1 kΩ	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	9		172 43 41	ns
		T_C = -55°C, +125°C C_L = 50 pF ±10% R_L = 1 kΩ	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	10,11		255 56 54	ns
Transition time 5/ See figure 4	t_{THL}, t_{TLH}	T_C = +25°C C_L = 50 pF ±10%	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	9		60 12 10	ns
		T_C = -55°C, +125°C C_L = 50 pF ±10%	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	10,11		90 18 15	ns

1/ For a power supply of 5 V ±10 percent, the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5 V. Thus, the 4.5 V values should be used when designing with this supply. Worst cases V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V respectively. (The V_{IH} value at 5.5 V is 3.85≡V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage, so the 6.0 V values should be used. Power dissipation capacitance (C_{PD}), typically 100 pF, determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC2} f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

2/ V_{IH} and V_{IL} tests are not required if applied as forcing functons for V_{OH} or V_{OL} tests.

3/ Set the output enable control pin to V_{CC} or GND, as applicable, to disable the outputs of the device.

4/ AC testing at V_{CC} = 2.0 V and V_{CC} = 6.0 V shall be guaranteed, if not tested, to the specified parameters.

5/ Transition times (t_{TLH}, t_{THL}), if not tested, shall be guaranteed to the specified parameters.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full case operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125° C, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

Device type	01
Case outlines	R and 2
Terminal number	Terminal symbol
1	DIR
2	A1
3	A2
4	A3
5	A4
6	A5
7	A6
8	A7
9	A8
10	GN
11	B8
12	B7
13	B6
14	B5
15	B4
16	B3
17	B2
18	B1
19	$\overline{\text{ENABLE G}}$
20	V_{CC}

FIGURE 1. Terminal connections.

Control inputs		Operation
$\overline{\text{ENABLE G}}$	DIR	
L	L	$\overline{\text{B}}$ data to A bus
L	H	$\overline{\text{A}}$ data to B bus
H	X	Isolation

H = High level

L = Low level

X = Irrelevant

FIGURE 2. Truth table.

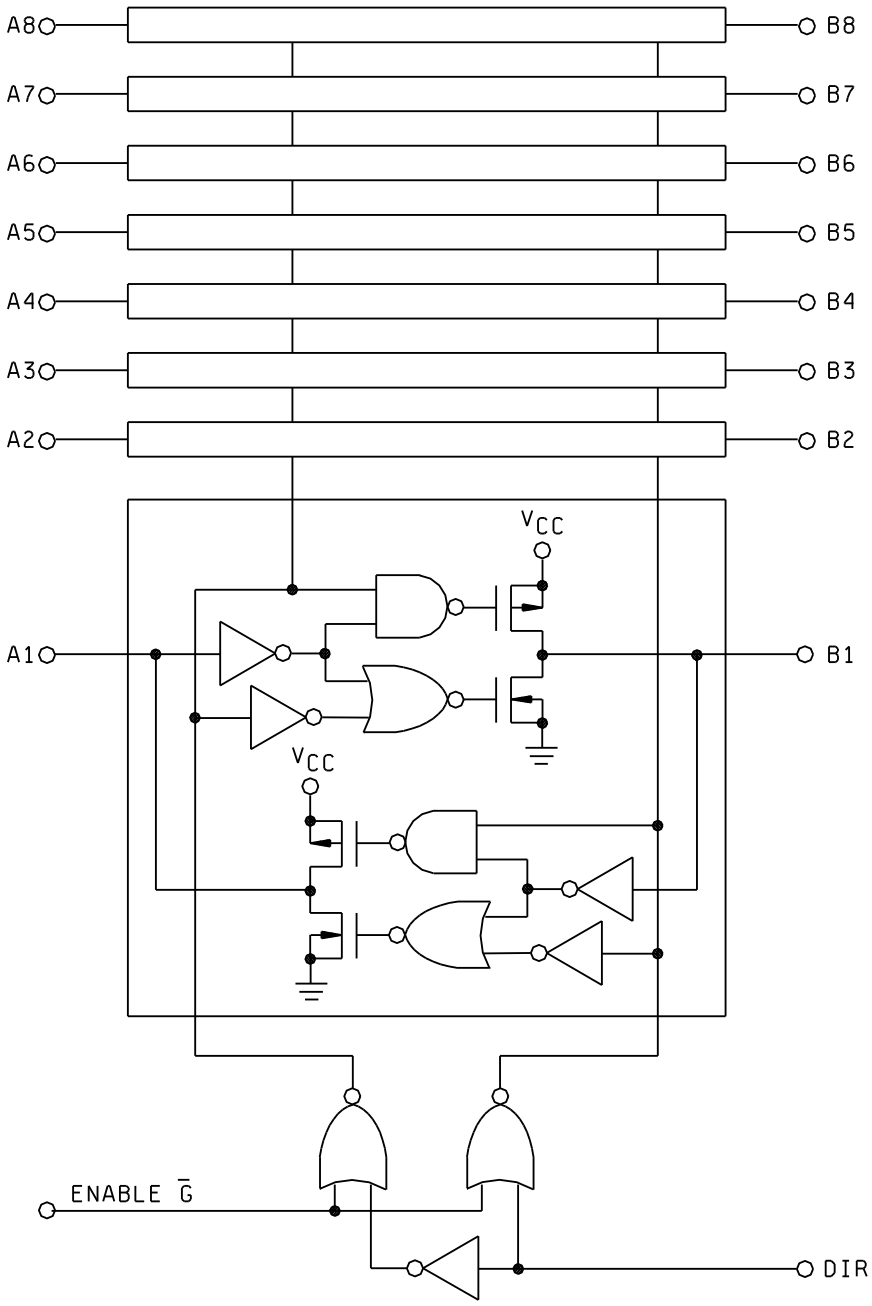


FIGURE 3. Logic diagram.

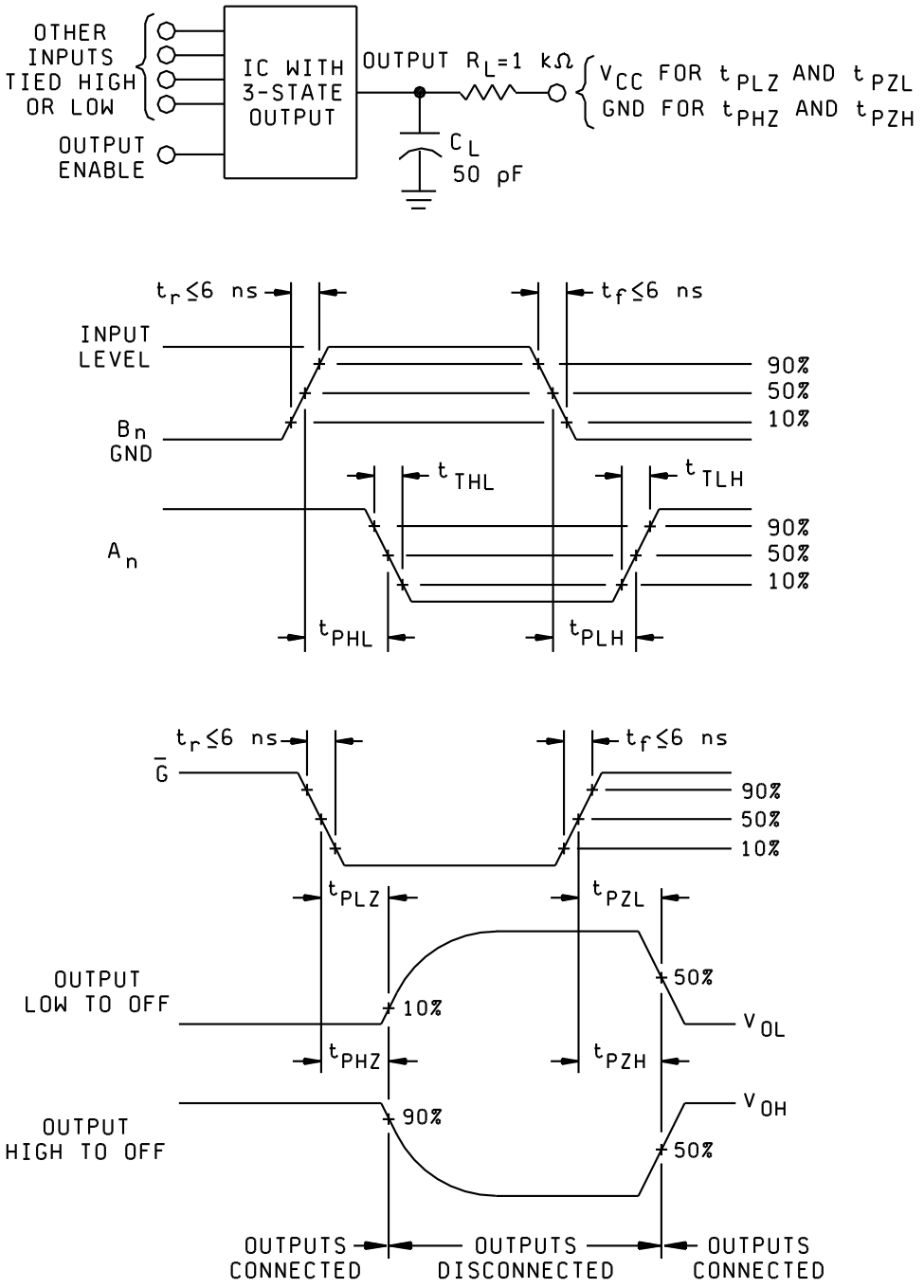


FIGURE 4. Test circuit and switching waveforms.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	
Final electrical test parameters (method 5004)	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 8, 9, 10, 11
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

*PDA applies to subgroup 1.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 5 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} and C_{IO} measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Capacitance shall be measured between the designated terminal and GND at a frequency of 1 MHz. Test all applicable pins on five devices with zero failures.

d. Subgroups 7 and 8 tests shall verify the truth table as specified on figure 2 herein.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65506B--.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-5375.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved sources of supply listed below are for information purposes only and are current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part 1/ number	Replacement military specification part number
5962-8780901RX	01295 34371	SNJ54HC640J CD54HC640FBA	M38510/65506BRX
5962-87809012X	01295	SNJ54HC640FK	M38510/65506B2X

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
01295	Texas Instruments, Incorporated 13500 North Central Expressway P.O. Box 655303 Dallas, TX 75265 Point of contact: I-20 at FM 1788 Midland, TX 79711-0448
34371	Harris Semiconductor P.O. Box 883 Melbourne, FL 32901